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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/805,027	03/12/2001	Lloyd G. Burrell	FIS920000242US1	1563

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RESTON, VA 20190

EXAMINER

LEWIS, MONICA

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 08/14/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/805,027

Applicant(s)

BURRELL ET AL.

Examiner

Monica Lewis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 July 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

1. This office action is in response to the election filed July 17, 2002.

#### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3 and 5-7 are rejected under 35 U.S.C. 103(a) as obvious over Venkatraman et al. (U.S. Patent No. 5,814,557) in view of Drynan (U.S. Patent No. 6,096,632).

In regards to claim 1, Venkatraman et al. ("Venkatraman") discloses the following:

- a) a patterned aluminum layer (14) (See Figure 2);
- b) a patterned copper layer (14 or 16) (See Figure 2 and Column 3 Lines 18-20);

and

- c) a liner (13).

In regards to claim 1, Venkatraman fails to disclose the following:

- a) a stud connection in an opening between a location on said patterned copper layer and a location on said patterned aluminum layer.

However, Drynan discloses a tungsten stud (106a) (See Figure 6b). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Venkatraman to include a tungsten stud as disclosed in Drynan because it aids in providing low contact resistance.

In regards to claim 2, Venkatraman fails to disclose the following:

- a) a layer of tantalum nitride, and a layer of PVD tungsten.

However, the limitation of "PVD tungsten" makes it a product by process claim. The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A "*product by process*" claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972); *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); *In re Fessmann*, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a "*product by, all of*" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "*product by process*" claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

In regards to claim 3, Venkatraman fails to disclose the following:

- a) a layer of titanium, and a layer of titanium nitride or PVD tungsten.

However, the limitation of "PVD tungsten" makes it a product by process claim. The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a

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product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A "*product by process*" claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972); *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); *In re Fessmann*, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a "*product by, all of*" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "*product by process*" claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

In regards to claims 5-7, Venkatraman discloses the following:

a) a patterned aluminum layer includes a layer of at least one of titanium, and titanium nitride (See Column 3 Lines 8-10).

In regards to claim 4, Venkatraman fails to disclose the following:

a) a stud connection is formed of tungsten

However, Drynan discloses a tungsten stud (106a) (See Figure 6b). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Venkatraman to include a tungsten stud as disclosed in Drynan because it aids in providing low contact resistance.

In regards to claim 8, Venkatraman discloses the following:

a) a patterned aluminum layer includes a layer of at least one of titanium, and titanium nitride (See Column 3 Lines 8-10).

4. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as obvious over Venkatraman et al. (U.S. Patent No. 5,814,557) in view of Drynan (U.S. Patent No. 6,096,632) and Jain (U.S. Patent No. 5,933,758).

In regards to claim 9, Venkatraman fails to disclose the following:

a) a covering layer.

However, Jain discloses a covering layer (50) (See Column 5 Lines 25-28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Venkatraman to include a covering layer as disclosed in Drynan because it aids in protecting the device from shortening out.

In regards to claim 10, Venkatraman fails to disclose the following:

a) a covering layer includes a layer of silane based high density plasma oxide.

However, Jain discloses a covering layer (50) (See Column 5 Lines 25-28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Venkatraman to include a covering layer as disclosed in Drynan because it aids in protecting the device from shortening out.

### ***Conclusion***

5. The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure: a) Jones, Jr. (U.S. Patent No. 5,313,089) discloses a capacitor and memory cell; b) Biery et al. (U.S. Patent No. 5,470,788) discloses a self aligned diffusion barrier; c) Bai et al. (U.S. Patent No. 5,714,418) discloses a diffusion barrier for interconnects; d) Fiordalice et

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al. (U.S. Patent No. 5,801,098) discloses an electrically conductive layer; e) Vitkavage et al. (U.S. Patent No. 5,858,873) discloses an integrated circuit having vias and contacts; f) Agnello (U.S. Patent No. 5,897,349) discloses a capped gate conductor; g) Dubin et al. (U.S. Patent No. 5,913,147) discloses copper aluminum metalization; h) Dalal et al. (U.S. Patent No. 5,981,374) discloses a multi-level interconnection structure; i) Roy (U.S. Patent No. 6,004,188) discloses a copper damascene structure; j) Yew et al. (U.S. Patent No. 6,025,264) discloses a barrier layer; k) Naik (U.S. Patent No. 6,054,380) discloses an interconnect structure; l) Jang (U.S. Patent No. 6,096,649) discloses a copper damascene structure; m) Hegde et al. (U.S. Patent No. 6,136,682) discloses a conductive structure; n) Annapragada et al. (U.S. Patent No. 6,140,221) discloses vias through porous dielectric material; o) Kitch (U.S. Patent No. 6,140,238) discloses a self aligned interconnect structure; and p) Liu et al. (U.S. Patent No. 6,150,272) discloses metal plug contacts.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 703-305-3743. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 703-308-4940. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML  
August 10, 2002

  
CARL WHITEHEAD, JR.  
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